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Test 473: Bolens 12BB

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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

NEBRASKA TRACTOR TEST NO. 473

Department of Agricultural Engineering
Dates of test: June 9 to June 14, 1952
Manufacturer: BOLENS PRODUCTS DIVISION,
FOOD MACHINERY CORP., PORT WASH-
INGTON, WISCONSIN
Manufacturer's rating: Not rated.

BOLENS 12BB

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury		
		Gal per hour	Hp-hr per gal	Lb per hp-hour		Cooling med	Air			
TESTS B and C—100% MAXIMUM LOAD—TWO HOURS										
1.95	3600	0.296	6.59	0.921	Air cooled	79	28.725			
TEST D—RATED LOAD—ONE HOUR										
1.80	3599	0.295	6.10	0.994	Air cooled	82	28.720			
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
1.80	3606	0.292	6.16	0.983	Air cooled	82			
0.06	4050	0.193	3.11	1.950	Air cooled	84			
0.98	3924	0.238	4.12	1.469	Air cooled	84			
1.75	2919	0.262	6.68	0.909	Air cooled	84			
0.50	4032	0.218	2.29	2.640	Air cooled	85			
1.41	3813	0.277	5.09	1.191	Air cooled	86			
1.08	3724	0.247	4.37	1.384	Air cooled	84	28.720			
TORQUE (At Dynamometer)										
Eng rpm	3912	3750	3594	3400	3264	3000	2682	2500	2388	1914
Lb-ft	6.51	6.77	7.23	7.50	7.70	7.90	8.09	8.06	8.03	7.83

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury
					Gal per hour	Hp-hr per gal	Lb per hp-hr		Cool- ing med	Air	
TESTS F and G—100% MAXIMUM LOAD											
1.63	205	2.99	3608	11.30	...Not Recorded ...			Air cooled	78	28.660	
1.19	210	2.13	3591	14.61	...Not Recorded....			Air cooled	84	28.660	
TEST H—RATED LOAD—TEN HOURS—High											
1.30	159	3.06	3600	6.35	0.226	5.75	1.052	Air cooled	90	28.670	
TEST J—OPERATING MAXIMUM LOAD—High											
0.94	124	2.85	3614	14.02	...Not Recorded....			Air cooled	99	28.670	

FUEL, OIL and TIME Gasoline octane No. ASTM 76 Research 82 (rating taken from oil company's typical inspection data); weight per gallon 6.063 lb Oil SAE 30; to motor 0.121 gal; drained from motor 0.095 gal; operating time 14 hrs—SAE 20; to motor 0.189 gal; drained from motor 0.107 gal; operating time 23 hrs—Total time motor was operated 37 hours.

CHASSIS Type two wheel garden tractor Tread width 17 $\frac{3}{8}$ " to 23 $\frac{1}{8}$ " Hydraulic control system none used Advertised speeds mph 1 $\frac{1}{4}$ to 3 $\frac{1}{4}$ by governor control and sheave adjustment Belt pulley diam 7 $\frac{3}{8}$ " for "B" section belt rpm 600 Clutch belt idler Seat none Brakes none Power take-off none.

ENGINE Make Briggs and Stratton Type single cylinder vertical Serial No. 199540 Crankshaft mounted crosswise Head L Lubrication splash Bore and Stroke 2 $\frac{1}{4}$ " x 2" Rated rpm 3600 Compression ratio 5.4 to 1 Displacement 7.95 cu in Port Diameter Valves inlet 7/8" exhaust 25/32" Governor Air Vane Carburetor Size $\frac{1}{2}$ " Ignition System magneto Starting System rope Air Cleaner oil bath wire mesh Muffler was used Oil Filter none Cooling medium temperature control air cooled engine.

***ENGINE** Make Clinton Type single cylinder vertical Serial No. 2062301 Crankshaft mounted crosswise Head L Lubrication splash Bore and Stroke 2" x 1 $\frac{1}{8}$ " Rated rpm 3600 Compression ratio 6 to 1 Displacement 5.89 cu in Port Diameter Valves inlet 13/16" exhaust 13/16" Governor variable speed centrifugal flyball Carburetor Size $\frac{3}{4}$ " Ignition System magneto Starting System rope Air Cleaner oil washed hair mesh Muffler was used Oil Filter none Cooling medium temperature control air cooled engine.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, and J were made with an operating setting of the carburetor (selected by the manufacturer) of 100% of maximum belt horsepower.

* The Clinton engine (observed 100% maximum belt horsepower 1.26) is used in the Model 12BA tractor.

HORSEPOWER SUMMARY

	Draw- bar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	1.73	2.07
2. Observed maximum horsepower (tests F & B)	1.63	1.95
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	1.30	1.76

We, the undersigned, certify that this is a true and correct report of official tractor test No. 473.

L. F. LARSEN
Engineer in Charge

C. W. SMITH
F. D. YUNG
L. W. HURLBUT
Board of Tractor
Test Engineers

TIRES, WHEELS and WEIGHT

	Tests F, G, & H	Test J	Test K
Two wheels			
Type	Pressed steel	Pressed steel	
Liquid ballast	25 lb each	None	
Added cast iron	52 lb each	None	
Tires			
No. and size	Two 5.00-12	Two 5.00-12	
Ply	2	2	
Air pressure	6 lb	6 lb	
Height of drawbar	12 inches	12 inches	
Static weight	364 lb	211 lb	
Total weight as tested	364 lb	211 lb	

No smaller tires suggested by manufacturer

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is held wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors, which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads of 20 minutes each: rated load, no load, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season.

The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

